THE UTILISATION OF TWO METRE COUNTRYSIDE STEWARDSHIP FIELD SCHEME GRASS MARGINS BY MEADOW BROWN *MANIOLA JURTINA* (L.) (LEP.: NYMPHALIDAE)

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Abstract

The utilisation of two-metre grass margins around arable fields by the Meadow Brown butterfly *Maniola jurtina* (L.) was investigated at three farms in Essex between 1997 and 2000. There was a significantly greater abundance of *M. jurtina* on the two metre grass margins than on the control sections (field edges without grass margins) but this abundance varied depending on the position of the margin and the initial seed mixture used. Two-metre grass margins could be improved as habitats for *M. jurtina* if they were established using a mixture containing a diverse range of grasses and nectar sources.

Introduction

There is an impoverished butterfly fauna on arable farmland in lowland England (Thomas, 1984) because it consists of a fragmented mosaic of habitats prone to seasonal change and under the annual trauma of the farming cycle (Macdonald and Smith, 1991). The result is an unpredictable and scarce supply of resources suitable for butterflies (Smith *et al.*, 1993).

Maniola jurtina (L) do not travel far (Brakefield, 1982; Feber *et al.*, 1994). As a consequence, in order to survive on grass margins they need mating, oviposition and foraging habitat (Wikland, 1977) all within a short distance. Hedgerows once helped to fulfil these roles, but with their wholesale removal in the 1960s and 1970s, the ability of farmland to support butterflies was substantially reduced (Dover, 1996). Hedges also provided shelter in open countryside. Sparks *et al.* (2000) pointed out that south-facing aspects against a dense hedge were amongst the most important of butterfly habitats, supporting work of Dover (1999), who showed a positive association between field corners, other sheltered areas, flower rich areas and concentrations of butterflies. Dover's (1999) association between butterfly concentration and flower rich areas agrees with the findings of Ehrlich (1984), who observed that the distribution of adult and larval nutritional resources was probably the major factor controlling the structure of non-migratory butterfly populations in temperate areas. Dover (1999) suggested that sub-optimal adult resources were the main limiting factor on butterfly abundance, with nectar from perennial sources in field boundaries being the most important (Dover, 1996).

The introduction of schemes such as the Countryside Stewardship Scheme (CSS) was to help enhance and provide important landscapes, wildlife habitats and public enjoyment of them (Rebane & Tucker, 1997). Dover (1999) suggested that butterflies were an important indicator of farmland biodiversity, an increase in butterfly abundance under CSS management possibly implying suitable conditions for a wide range of other invertebrate species.

One part of the CSS was the creation of two metre grass margins around arable fields. These margins were to be sown with a tussocky type of grass seed mix containing 50% *Phleum pratense* and/or *Dactylis glomerata*, and/or *Holcus lanatus*. The margins had to be cut three times in the first year and then cut no more than one year in three and then only to stop encroachment of scrub species (MAFF, 1997).

The aim of this study was to investigate the effects of such two-metre grass margins on abundance of the Meadow Brown butterfly *M. jurtina*.

Method

Three farms at Writtle (O. S. grid reference TL 670070), Highwood (TL 630036) and Greenstead Green (TL 810288), all in Essex joined the CSS in 1996 and monitoring work was undertaken at these three sites during the period 1997-2000. The main attributes of these margins are highlighted in Table 1, while the composition of the mixtures sown is given in Table 2. *M. jurtina* abundance was monitored between late June and early August each year using the transect method (Pollard, 1977). Thirteen two-metre grass margins and at least three control sections (field edges without grass margins) were monitored once a week when weather conditions were suitable (Pollard and Yates, 1993). The total observations were added together and a figure for *M. jurtina* per km per visit was calculated.

Results

At all three sites the abundance of *M. jurtina* increased from the first year of monitoring (Table 3). At two of those sites, Writtle and Greenstead Green, substantially more were observed on the two metre grass margins than on the control sections. At Highwood even though *M. jurtina* were more abundant on the two-metre grass margins the difference was small.

There were marked differences in *M. jurtina* abundance on the two-metre grass margins at Greenstead Green with G2.5 having the greatest abundance in three of the four years. This was surprising as this section had no hedge or ditch and was dividing one large field into two (Table 2). At Writtle the best two sections W2.2 and W2.3 were once again dividing a field into two, but this time a newly planted hedge was alongside the margins.

Overall *M. jurtina* abundance was significantly greater (Sign test, P=0.001) on the two metre grass margins than on the control sections (Table 3). The two metre grass margins were established using different grass mixtures and for each year the mean abundance of *M. jurtina* was greater on the grass margins established using mixture one (Table 4).

Discussion

Establishing two-metre grass margins around arable fields will increase abundance of *M. jurtina*, compared to fields without margins. All three sites showed an increase, with a significant increase being found overall. Increases could be far greater had the CSS grass margins been set up differently (Kirkham *et al.* 1999). None of the

two-metre grass margins at any of the sites came up to the suggested minimum habitat-size requirement of *M. jurtina* of between half and one hectare (Thomas, 1984).

One reason why two-metre grass margins were unsuitable for *M. jurtina* may be because there were not enough nectar sources, which are vital for the female when first emerging to mature the eggs. Feber *et al.* (1996) suggested that the best predictor for *M. jurtina* abundance in July was the abundance of *Leucanthemum vulgare* and in August the abundance of *Centaurea* species. Neither of these was included in any seed mixtures. As only grasses were sown, there was an almost complete lack of nectar sources available for butterflies. Several authors (Watt *et al.*, 1974; Murphy *et al.*, 1993; Dover, 1994; 1999; Feber *et al.*, 1996) have identified that the availability of nectar sources is the limiting factor to butterfly abundance. Cost was the most likely reason for not including wildflower seed in the statutory mixtures.

Table 1: Attributes of the margins at the three sites.

	Size margin (m)	Section length (m)	Aspect	Hedgerow length (m)	Sown with mix
Writtle					
W2.1	2	274	NE/SW	150	3
W2.2	2	274	NW/SE	274	3
W2.3	2	270	NW/SE	270	3
WN2.4	No margin	133	NE/SW	100	
Greenstead Green					
G2.1	2	450	E/W	390	1
G2.2	2	141	E/W	141	2
G2.3	2	250	E/W	150	1
G2.4	2	320	NE/SW	320	1
G2.5	2	285	NE/SW	0	2
GN2.6	No margin	180	E/W	160	
Highwood					
H2.1	2	200	N/S	200	2
H2.2	2	762	E/W-N/S	450	2
H2.3	2	467	N/S-E/W	467	2
H2.4	2	500	NE/SW	400	2
H2.5	2	285	ENE/WSW	0	2
HN2.6	No margin	343	ENE/WSW	300	

The vegetation on the two-metre grass margins was far taller than that identified as being critical (1-20 cm) for *M. jurtina* (Goldsmith, 1991). The taller vegetation results in less warm spots for the female to bask in, and an unsuitable egg laying habitat. Smith *et al* (1993) suggested that more *M. jurtina* were found on cut sections, showing the profound effect of a warmer micro climate on resting butterflies. This research did not investigate the suitability of the egg and larval habitats, but the length of vegetation may have caused a reduction in warmth to both of these stages, so affecting development. The effect of using grass seed from agriculturally improved sources also cannot be judged, but the selection of grass species in some of the mixtures was not beneficial to the *M. jurtina*.

Table 2: Seed mixtures used on the two metre margins at the three sites.

	Writtle	**Greenstead Green**		**Highwood**
Date established	Oct 1997	Oct 1996	Oct 1997	Oct 97-Oct 00
Length in research transect	818 m	1020 m	426 m	2214 m
Seed mix	Mix 3	Mix 1	Mix 2	Mix 2
Dactylis glomerata	50%		50%	50%
Festuca pratensis	10%		25%	25%
Festuca arundinacea			10%	10%
Poa pratensis		7.5%	15%	15%
Festuca ovina	20%	25%		
Cynosurus cristatus	15%	7.5%		
Trisetum flavescens	5%			
Festuca rubra subsp. *commutata*		30%		
Agrostis tenuis		5%		
Festuca rubra		25%		

The CSS agreements with farmers identify a range of grasses to be used within the grass margins but these were not associated with native grass mixtures growing in areas of the country. The farmers at all three farms in this study bought the grasses on price and availability only. Each farmer had establishment failures due to selecting species not suitable for their soil type. Why simple tables of suitable grasses, as produced by Marshall (1998), could not be included in the agreements, is surprising. Even using the list supplied by Marshall (1998) might not ensure that suitable larval food plants would be sown, but if the mandatory number of species in the mixture was increased, there would be more chance that some larval sources would be included.

There is also a lack of native seed for grasses, resulting in grasslands sown with seed from agriculturally improved sources. Kirkham *et al.* (1999) suggested that a tussocky mix, as used in the CSS, was the most inappropriate grass mixture out of a range of grass margins sown at the ADAS experimental farm at Boxworth. It is therefore difficult to understand why it was chosen for the CSS.

The hedgerow management of trimming once every three years in January and February, as specified by the CSS agreement, may also not benefit butterflies. In a recent study Maudsley *et al.* (2000) suggested that at five out of six sites hedgerows cut in September had greater number of Lepidoptera larvae in May, than those cut in February. This difference was significant at two of the sites.

In conclusion, the two-metre grass margins as set up under the CSS in October 1996 were better than not having no grass margin at all. However, it is suggested that a major opportunity has been missed because what has been created is a

Table 3: Abundance of *Maniola jurtina* (mean number/km/visit) on two metre margins at three farms

	Number of 2m margins	Mean *M. jurtina*	Range	Control
Writtle	**3**			
July 1998		3.4	0-8.8	1.5
July 1999		19.7	7.9-37.1	1.3
July 2000			7.3-20.9	0
Greenstead Green	**5**			
July 1997		15.2	3.3-35.1	3.2
July 1998		11.3	2.8-21.1	2.2
July 1999		33.4	23.3-49.9	4.6
July 2000		24.2	5.1-33.9	6.9
Highwood	**5**			
July 1998		4.7	2.4-8.1	4.1
July 1999		10.4	5.9-14.2	3.9
July 2000		12.8	3.1-29.4	9.5
		15.5		**3.6**

'monoculture' of improved grassland, which Thomas (1984) rates as supporting at best only one to three butterfly species. With a little thought and reference to previous research such as that of Smith *et al.* (1993), an unimproved type patchy pasture/tall grassland which supports 23 to 28 butterfly species (Thomas, 1984) could have been created.

Table 4 : *Maniola jurtina* abundance (mean number/km/visit) by seed mixture sown.

	Mixture 1	Mixture 2	Mixture 3
July 1998	10.9	4.8	3.4
July 1999	33.5	16.9	19.7
July 2000	23.1	16.6	18.4

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Mythimna albipuncta (D. & S.) in north-west Kent

B. K. West (*Ent. Rec.* **115**: 292) described *Mythimna albipuncta* as an unusual migrant to north-west Kent. My home, also in north-west Kent, lies about 13 km to the east of West's, just 400 metres from the River Thames. A trap is also operated regularly by Roger Kiddie about 1.5 km south-east from here. Prior to 1998, Roger recorded *M. albipuncta* on 29.vi.1996 and I had one on 6.x.1996.

After my return from Kenya at the end of 2000 the situation was rather different and the figures are given per generation (numbers taken by R. Kiddie in parentheses):

	1st generation	2nd generation	3rd generation
2001	–	4 (1)	
2002	9	4 (1)	
2003	>2* (1)	6 (1)	(1)

*exact numbers not recorded.

This species is well known to be resident near the Channel coast and is frequently taken in East Kent. These figures show clearly that the species is locally resident in the Gravesend area, especially since the captures were not associated with migration of other species. In view of this specimens reaching B. K. West near Dartford are just as likely to be vagrants from a nearby population as to be primary migrants. — David Agassiz, 23 St James's Road, Gravesend, Kent DA11 0HF.